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Searching for an Alternate Way to Identify Young Creative Minds: A Classroom-Based Observation Approach

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Abstract

Creative ability in young children has traditionally been assessed through the use of standardized tests of divergent thinking. This study investigated an alternate way of identifying creative ability. The concurrent validity of a more developmentally appropriate and authentic, behavior-based observation approach was examined on a sample of 45 kindergarten children from an urban elementary school. Significant, but relatively weak correlations were found between the Nebraska Starry Night Observation Protocol (NSNO) and the originality and elaboration scores of the concurrent measure, the Torrance Tests of Creative Thinking (TTCT). Implications of using the NSNO to identify young creative children are discussed.

Creativity is a much desired and respected talent (Shmukler, 1988) and a vital component of giftedness (e.g., Albert & Runco, 1986; Copley, 1992; Feldhusen & Treffinger, 1990; Renzulli, 1978; Sternberg & Davidson, 1986). Consequently, issues of creativity measurement or assessment have captured educators' attention for decades (e.g., Dawson, 1997; Ford & Harris, 1992; Han & Marvin, 2002; Hocevar, 1981; Hunsaker & Callahan, 1995; Jackson & Messick, 1965; Sternberg & Lubart, 1995; Treffinger, Renzulli, & Feldhusen, 1971).

Not surprisingly, many school districts require that creativity be considered in determining which students receive gifted education. Unfortunately, creativity has received minimal weight in the overall selection criteria for gifted programs (Milgram, 1990). Thus, most school districts, a student's giftedness is determined al-

most exclusively by high academic grades and intelligence test scores (Kirschenbaum, 1986). As a result, more creative and divergent thinkers are often excluded from gifted education programs because they do not always score high on these traditional measures (Richart, 1990; Torrance, 1962, 1963, 1965, 1988).

If creative potential is not identified systematically and nurtured responsibly, valuable talent may be wasted (Barron, 1988; Feldman, Csikszentmihalyi, & Gardner, 1994; Han & Marvin, 2000). Researchers have repeatedly shown that the underidentified and unrecognized giftedness of highly creative children may lead to repression of their creative interests, cause frustration and emotional problems, and place these students at risk for academic and/or social underachievement (Butler-Por, 1993; Ehrlich, 1982; Kitano & Kirby, 1985; Whitmore, 1980). In addition,

underachievement in children has been attributed to the failure to provide appropriate challenges and support in early years (Butler-Por, 1993; Kames & Johnson, 1991; Whitmore, 1980). In brief, identification and nurturance of creative talents in the early years are essential for the optimum development of creatively gifted children (Kames & Johnson, 1991).

Identification of creative children has been limited primarily because of a lack of appropriate assessment instruments (Amabile, 1996; Barron, 1988; Ford & Harris, 1992; Houtz & Shaning, 1982; Runco & Albert, 1990; Stearns, 1994; Young, 1985). According to Treffinger (1986), as there is no single uniformly accepted theory of creativity, no single creativity assessment instrument is universally accepted. Existing instruments assess different traits under the title of "creativity"; and often lack acceptable psychometric qualities (Milgram, 1990).

Divergent Thinking Tests and the Torrance Tests of Creative Thinking (TTCT)

Of the several tests available to identify children's creative ability (e.g., Guilford, 1971; Rimm & Davis, 1976; Torrance, 1966), the Torrance Tests of Creative Thinking (TTCT), a divergent thinking test, is the most widely used and respected (Amabile, 1996; Baer, 1993; Hennessey & Amabile, 1988; Hocevar, 1981; Khatena, 1982). Indeed, it was used in three-fourths of all published studies of creativity involving elementary and secondary school students over the last 20 years (Baer, 1993). The TTCT was developed to assess four creative abilities: fluency, flexibility, originality, and elaboration. In over two decades of research, it has shown reasonable reliability and validity in measuring creative thinking abilities in individuals from kindergarten through graduate school (Cooper, 1991). According to Treffinger (1985), the test-retest reliability of the TTCT in these studies ranges from .50 to .93. Although Chase (1985) suggested that the construct validity of the TTCT is weak, its predictive valid-

ity has been reported as being positively and significantly correlated with creative achievement criteria in several studies involving periods as brief as 9 months and as long as 22 years (Treffinger, 1985). It has been accepted that divergent thinking tests like the TTCT are useful estimates of the potential for creative thought (Khatena, 1982; Runco, 1991, 1993); further, the TTCT represents a currently accepted measure of children's creative performance (Hennessey & Amabile, 1988).

However, there are limitations to divergent thinking tests, including the TTCT (Runco & Nemiro, 1994). First, some people mistakenly treat divergent thinking as the same as creative thinking (a sort of "g" factor underlying all types of creativity). Such an approach is problematic in that divergent thinking may be involved in some creative performance, but not required in all domains (Anastasi, 1982; Baer, 1991, 1993; Brown, 1989; Milgram, 1990; Runco & Nemiro, 1994). Further, it has been argued that such tests measure only a narrow scope of abilities and tend to reflect creative potential rather than actual creative performance (Runco, Noble, & Luptak, 1990). Second, the construct and predictive validity of the divergent thinking tests have been seriously questioned (Brown, 1989; Kitto, Lok, & Rudowicz, 1994). For example, Wallach (1992) noted that the use of divergent thinking tests as a criterion of creativity is unwarranted. Third, the purportedly objective scoring procedure of divergent thinking tests is subjective, depending on the examiner's own interpretation. Amabile (1996) commented, "... methods attempting to objectively identify features of products as creative are not widely applicable and, ultimately, cannot be used as sole indicators of creative judgments. Creativity tests, though seemingly objective, are in fact based in subjective creativity judgment" (p. 33). Fourth, ample evidence suggests that the results of divergent thinking tests can be influenced by situational or contextual factors, especially in young children (e.g., Amabile, 1996; Barron & Harrington, 1981). Fifth, the

items of currently available divergent thinking tests have been criticized as being abstract or artificial (Houtz & Krug, 1995). Finally, it has been suggested that divergent thinking tests, like the TTCT, are impractical because they require considerable training for scoring, and considerable time, effort, budget, and personnel to administer to large populations of children (Auzmendi, Villa, & Abedi, 1996; Steams, 1994). Overall, therefore, a (standardized) divergent thinking instrument for assessing creativity, with satisfactory psychometric properties, remains unavailable (Runco, 1993). The TTCT nevertheless is regarded as the best standardized instrument of creative potential among available divergent thinking tests or other kinds of creativity tests (O'Neil, 1994).

A Call for More Authentic Approaches

Taking these limitations and criticisms into consideration, a divergent thinking test approach to identify creative children has been challenged (e.g., Amabile, 1996; Baer, 1993; Runco, 1991), especially for young children. Dissatisfaction with current divergent thinking tests combined with the need to broaden the definitions of creativity and to assess a young child's needs and strengths has led to requests for more innovative methods and authentic approaches to assessing/identifying creative children. In response, many researchers have recommended a focus on young children's creative behaviors, accomplishments and/or creative products (Amabile, 1996; Baer, 1993; Barron & Harrington, 1981; Hocever & Bachelor, 1989). Further, the National Association for the Education of Young Children (Bredekamp, 1987; Bredekamp & Rosegrant, 1992) has suggested that the goal should be a greater reliance on systematic observations of young children and "recording behavior" rather than evaluation. Overall, there is a clear call for better ways to assess and identify young creative children using a more authentic and developmentally appropriate approach.

Nebraska Project

One effort toward developing an innovative approach to identifying creative young children was the Nebraska Project (1990-1993), funded by the Jacob K. Javits Education Act, 1989. Serious effort was made during the project to find young able/creative children in a developmentally appropriate way. The Nebraska Starry Night Observation (NSNO) protocol was developed to provide K-2 grade classroom teachers with a means of early identification of able and creative children. In particular, traditionally underserved children in small rural schools and from minority cultural groups were sought. The results of the Nebraska Project indicated that the NSNO yielded rich behavioral data as a culture-free tool for early identification of able/creative children in regular classrooms (Griffin, 1993; Griffin & McKenzie, 1993; Han & Marvin, 2000). A total of 240 children, from the total sample of 1,970 kindergarten through second-grade children, were identified as "able and creative" using the NSNO during the Nebraska Project. Further, 16% of the children represented minority populations (Griffin, 1995). As the intent of the NSNO was to be inclusive, and to cast a wide net to identify "possibly," "probably," "particularly," and "precisely" able and creative children, the Nebraska Project demonstrated that significantly higher percentages of children overall, and minorities in particular, could be identified as "able and creative" using a developmentally appropriate, observation-based scale in primary classrooms.

Nebraska Starry Night Observation Protocol

The NSNO represented a significant advancement in the expansion of the definition of "able and creative" and the methodology for identifying young able/creative children. First, it recognized the multiple manifestations of high ability and creativity that are perceived as being observable, developmental, and process-oriented (Borland, 1978; Bredekamp & Rosegrant,

1992; Gear, 1978; Kames & Johnson, 1986; Renzulli, Hartman, & Callahan, 1971). The NSNO instrument provided nominal descriptions of 17 key qualities or behaviors found repeatedly in the literature on characteristics of able and creative children. Examples of the specific affective/behavioral characteristics assessed by the NSNO include moving and doing, humor, sensitivity, fantasy, imagery, and curiosity. The literature in both early childhood and gifted education has shown that children's behaviors are important early indicators of high-level ability and creativity. Despite a general consensus that behaviors are valid, observable indicators of early ability and creativity (Bredenkamp & Rosegrant, 1992), the translation and application of the information by teachers to identify able/creative children in general education classrooms traditionally has been both logistically and operationally difficult (Griffin, 1995). It is the merit of the NSNO that it organized the 17 research-based early indicators of high ability and creativity in a nontraditional, authentic, user-friendly, and developmentally appropriate format.

Second, the NSNO required that a tally system be used to note the frequency with which teachers observe any of these 17 behaviors or qualities in the children's classroom activities, interactions, and assignments over a period of two weeks. The "constellation" of at least three different behaviors with at least eight total observations across the constellation constituted identification criteria for a potentially able and creative child. After much discussion, debate and review of existing materials, criteria for both the number of behavior codes and the number of constellations required to segregate an identified sample were set. Although Silverman (1986) and others have suggested that young, able children exhibit many, if not most, of the early behavior indicators selected for the protocol, in the real-world regular classrooms of the project, it was not expected that a

teacher would be able to (a) observe all children continuously, (b) see or judge out-of-level behaviors continuously, or (c) monitor both process and product behaviors simultaneously and consistently. The minimum criterion was based on the assumption that able and creative children could be observed using multiple (three or more) above-level behaviors weekly, and the criteria were validated through subsequent consideration of data analyses in previous studies (Griffin, 1995). The authors of the NSNO also believed that such liberal criteria would best identify all possible candidates with the greatest variety of possible qualities. Using this paradigm, identification of young able/creative children with the NSNO system could be based on children's daily performance over time rather than on one-shot tests. Thus, this approach can help reduce some of the constraints associated with more test-like situations used traditionally.

Third, by combining the authentic instrument (NSNO) and an observation technique (over time), the NSNO highlighted children's potential talents and abilities by actually encouraging (training) teachers to look for them in classroom activities that could naturally elicit them. As Ford (1994) suggests, by using the NSNO, children are more likely to be truly assessed and not just identified. Rather than getting a "yes/no" answer to the question of whether the child is able/creative, by using the NSNO teachers can describe the children's gifted traits by noting academic, social, or emotional behaviors that occur spontaneously and possibly consistently during child-oriented classroom activities and/or instruction of academics.

Finally, the NSNO was intended to go beyond traditional summative "test scores" to provide guidance for the educational process as well. Standardized tests, while having an important place in the overall assessment scheme, are generally not designed to provide behavioral indicators of special ability, especially for young children. Unlike most test scores, the information

obtained on the NSNO could be used both as a guide to early identification and to assist teachers in structuring individualized instruction. Further, whereas certain test scores tend to be exclusive, the NSNO intended to be inclusive and at the same time descriptive of the particular abilities and preferences of individual children.

Validity Issues and Purpose of the Study

Satisfactory inter-rater reliability (.50-.90) for the NSNO was established during the Nebraska Project through the use of videotape training and a pool of three expert observers (Griffin, 1995). The content validity of the 17 behaviors on the NSNO was established through an extensive review of the literature. Griffin and McKenzie (1993) describe 12 primary citations appearing in the literature over a period of more than 20 years that report these characteristics/traits in creative individuals. Multiple behaviors were cited as important early indicators of able/creative children in 111 of the papers (DeHaan & Havighurst, 1961; Duncan & Dreger, 1978; Ehrlich, 1982; Glasnapp, 1981; Kitano, 1989; Male & Perrone, 1979; Mitchell, 1987; Ogilvie, 1973; Renzulli, Smith, Callahan, White, & Hartman, 1976; Roedell, Jackson, & Robinson, 1980; Silverman, 1986). No behavior in the NSNO protocol was selected without the support of fewer than seven citations (Griffin, 1995). Table 1 shows a matrix of cited supports for the 17 behaviors included. Appendix A provides definitions for each NSNO behavior.

Although the NSNO has shown its potential as an effective tool for identifying able/creative children during the Nebraska Project, its primary weakness has been a lack of demonstrated validity in enhancing the selection process of able/creative children (Griffin, 1995). For example, no research has investigated the efficacy of the NSNO compared to more traditional paper-and-pencil tests of divergent thinking to measure giftedness/creativity in young children. The purpose of the present study was to examine the concurrent validity of the NSNO. The results of the

NSNO and the TTCT were compared. Although the TTCT appears to be more cognitively oriented whereas the NSNO seems to reflect more affective and behavioral characteristics, both the TTCT and the NSNO purport to measure constructs related to creativity (Griffin, 1993; Torrance, 1966). Therefore, it would be important to explore the relationships between these instruments. It was predicted that the NSNO would be related to the TTCT to some degree because tests of divergent thinking are still considered important estimates of an individual's potential for creative performance (Runco, 1991). A positive correlation between these two instruments would be important to the process of identifying able/creative young children. A negative or weak correlation would suggest that two independent definitions may exist for creativity and/or traits associated with able/creative children; such findings would prompt a need for attention to both types of measures when attempting to identify all possible able/creative young children.

Method

Participants

All 70 kindergartners in four kindergarten classrooms of an urban elementary school were targeted. Forty-five (64%) of the 70 children's parents signed consent forms permitting their children to act as subjects for this study. The four kindergarten classrooms were composed of two morning classrooms and two afternoon classrooms taught daily by two kindergarten teachers. Participants ranged in age from 4 to 6 years and represented children of Caucasian, Native American, and African American ethnicity. Table 2 provides the demographic information on the participants.

Procedures and Instruments

The gifted education facilitator of the elementary school and the first author collaborated in

Table 1. Content Validity Matrix: Citations in Selected Literature for 17 Behaviors in the NSNO

	Dehann & Havighurst	Duncan & Dreger	Ehrlich	Glasnapp	Kitano	Lewis	Male & Perrone	Mitchell	Oglivie	Renzulli et al.	Roedell et al.	Silverman
Vocabulary	X	X	X	X			X	X	X	X	X	X
Moving	X		X				X	X		X	X	X
Engage			X	X			X	X	X	X	X	X
Recognized		X	X		X		X	X		X		X
Share		X	X	X			X	X	X	X	X	
Explore		X	X	X			X	X		X	X	X
Observant	X		X	X				X	X	X		X
Humor			X				X	X	X	X	X	X
Sensitive		X	X	X			X	X	X	X		X
See big picture	X		X	X			X	X	X	X	X	X
Acts			X			X	X	X	X	X	X	
Fantasy			X	X	X		X	X	X	X	X	
Imagery	X		X	X			X	X	X	X	X	
Curiosity	X		X	X	X		X	X	X	X		X
Independent		X	X	X			X	X	X	X		X
Focus	X	X	X	X			X	X	X	X	X	X
Knows	X	X	X	X	X		X	X	X	X	X	X

Table 2. Participants' Demographic Information

	N	Percent
Gender		
Boy	24	53%
Girl	21	47%
Age		
4 years old	1	2%
5 years old	38	85%
6 years old	6	13%
Ethnicity		
Caucasian	43	96%
Native American	1	2%
African American	1	2%

collecting the data as part of a routine fall-term screening of kindergarten children in the particular school. In addition to a routine standardized (norm-referenced) group-administered assessment, the school administration and the gifted facilitator were interested in exploring the feasibility of efficiently including additional (criterion-referenced) assessments that would be more descriptive of children's abilities and interests. All 45 children in the kindergarten classrooms were administered the *Torrance Tests of Creative Thinking* (TTCT) in mid-October of their kindergarten year. In addition, the gifted education facilitator and the first author observed all children for a period of two weeks between mid-September and early October during regularly scheduled classroom activities using the Nebraska Starry Night Observation Protocol (NSNO). Following sections provide a description of these assessments and the procedures for their use in this study.

TTCT. All 45 children of the participating school took the Figural Section of the TTCT (Form A). This test is a group-administered paper-and-pencil measure, with oral instructions for children. It contains a battery of three tasks

requiring children to draw pictures using circles and lines and to write titles for the drawings. The gifted facilitator administered the test in approximately 30 minutes in each of the four kindergarten classes in the middle of October, while other adults (classroom teacher, two paraeducators, and one parent) helped the children write the titles for their drawings. Each child's test was identified with a number code, not by the child's name, to avoid personal identification and bias during scoring. Both the gifted facilitator and the first author scored the drawings following a standard scheme designed to provide objective results on originality (creative strength), fluency (number of items completed), flexibility (number of different categories of responses), and elaboration (exposition of detail).

NSNO. Onsite observations were conducted by the gifted facilitator and the first author over a two-week period (mid-September through early October) in each of the four kindergarten classrooms. Although direct observations by classroom teachers were preferred, it was impossible to coordinate in a timely fashion because of teachers' busy classroom responsibilities. Both the gifted facilitator and the first author had re-

ceived training on how to use the NSNO instrument during the Nebraska Project. The gifted facilitator observed two classrooms; the first author observed the other two. Each spent at least 30 minutes every day in each classroom for 15 days, observing children in diverse activities (e.g., reading time, music, P.E., recess, snack, etc.), using the NSNO to guide observation and notation of unique behaviors observed. Specifically, for each observation session the observers wrote a brief description of the observed behaviors, the children who demonstrated the behaviors and (after the session) wrote a more complete description of the behaviors and the contexts in which they occurred. At the end of each school day, the observers reviewed all notes and identified behavioral constellation(s) emerging for any child. NSNO coding sheets were used to record each child's behaviors considered unique, novel, or outstanding for the age group. Thus, the NSNO reflected a combination of frequency and unique quality dimensions of the behaviors observed. Appendix A shows the NSNO protocol.

Reliability. The inter-rater reliability of the two observers using the NSNO was supported through the use of videotape training. The two observers viewed and judged behaviors depicted in vignettes selected from videotapes made during the Nebraska Project. The two observers agreed on which children in each scene demonstrated specific able/creative behaviors listed on the NSNO. The agreement between the observers was over 80 %. Inter-rater agreements for the scoring of the TCCT figural test were high: 92% for fluency, 88% for flexibility, 80% for originality, and 73% for elaboration scores.

Data Analyses

The TTCT and the NSNO data for the 45 children were entered into a computerized database by the first author of this study. Twenty percent of the data were entered a second time by a research assistant, who was trained in interpretation and entry of the data. Point-by-point

agreement was 98%; all identified errors were corrected before the data were analyzed.

Data were analyzed using the SPSSx statistical software program, which provided descriptive data, including frequencies, percentages, means, and standard deviations for the four subscores of the TTCT and the overall frequency of the NSNO behaviors. Pearson product correlations were used to explore the relationships between the subscores of the TTCT and total frequency counts of 17 key behaviors noted during direct observation using the NSNO.

Results

Among the 45 children in the study, eight children, 17.7% of the total sample, met the criterion for early identification of able and creative children, which was eight or more total behaviors representing three or more types (constellations) of behavior on the NSNO. Total number of behaviors observed during the two-week period was 193. The mean total NSNO behaviors observed was 4.3, with the standard deviation of 6.4. Table 3 provides a summary of the frequency with which each NSNO behavior was noted. As illustrated, the most frequently observed behaviors included "knows," "observant," "vocabulary," "imagery," "see the big picture," and "fantasy." Twenty-one children were observed to demonstrate at least one or more outstanding behaviors, but at levels not meeting the identification criterion set by Griffin (1995). However, it was assumed that their behavior events nevertheless provided useful information to the observers and teachers regarding the particular learning preferences of those children. The remaining 16 children were not noted as demonstrating any outstanding behaviors. Over time some of these children might be observed exhibiting unique, novel, or outstanding behaviors as well, but they were not observed as such during the time sample of this study.

Table 3. Frequency Counts for NSNO Observed Behaviors

NSNO Behaviors	Total Frequency Observed	Number of Children	Mean	Standard Deviation
Vocabulary	212	12	1.75	1.22
Moving	3	2	1.50	.72
Engage	8	5	1.60	.89
Recognized	5	4	1.25	.50
Share	1	1	1.00	.00
Explore	4	3	1.33	.58
Observant	28	17	1.65	1.11
Humor	1	1	1.00	.00
Sensitive	4	4	1.00	.00
See big picture	18	11	1.64	1.29
Acts	6	3	2.00	1.00
Fantasy	14	7	2.00	1.53
Imagery	19	10	1.90	1.45
Curiosity	8	5	1.60	.89
Independent	11	8	1.38	.74
Focus	9	3	3.00	2.00
Knows	33	15	2.20	.77

On the TTCT, 4 of the 45 children in the sample scored more than two standard deviations above the group mean on two or more subscores (T scores above 70). These four children were considered as showing exceptional creative performance. Three of them were also identified as able and creative using the NSNO protocol.

The means of the four subscores for fluency, flexibility, originality and elaboration were lower than the norm, and the standard deviations were much larger for this sample than the ones described in the TTCT norm-technical manual. Means (SD) for fluency, flexibility, originality and elaboration were 15.9 (9.8), 11.4 (7.2), 20.3 (17.2) and 40.9 (48.3), respectively. When converted, the mean T scores (SD) were 35 (17.6), 37 (15.2), 38.4 (18.9), and 32.3 (24.4), respectively. The TTCT manual suggests a mean T score of 50 and a standard deviation of 10. These findings might suggest that the TTCT, which requires a total of 30 minutes to complete, may be

too long and cause fatigue in some children. In addition, some children had trouble expressing their thoughts because of their lack of fine-motor (drawing) skills, yet they had unique and novel ideas. Thus, in some cases children's nonconcrete and scribbled drawings did not match their creative titles. This may indicate that the TTCT was not developmentally appropriate for some kindergarten children.

The Pearson product-moment correlations indicate that the total frequency of behaviors noted during direct classroom observation using the NSNO was significantly related to the originality ($r = .38, p < .05$) and elaboration ($r = .43, p < .01$) scores of the TTCT, but not to the fluency and flexibility scores. The correlations between the total frequency counts on the NSNO and the fluency and flexibility scores of the TTCT were relatively weak ($r = .25$ and $r = .21$, respectively). The average correlation of the four subscores of the TTCT with the total frequency counts on the

Table 4. Correlations Between the Subscores of the TTCT and the Total Frequency of 17 Behaviors Using the NSNO, and Means and Standard Deviations for 45 subjects.

	NSNO		TTCT			Mean Score	Standard Deviation
	Fluency	Flexibility	Originality	Elaboration			
NSNO	1.00	.25	.21	.38*	.43**	4.3	6.5
TTCT	.32*						
Fluency		1.00	.91**	.74**	.49**	15.9	9.8
Flexibility			1.00	.65**	.43**	11.4	7.2
Originality				1.00	.84**	20.3	17.2
Elaboration					1.00	40.93	48.3

* $p < .05$; ** $p < .01$

NSNO was .32 (which was significant at a = .05 level). The highest correlation ($r = .43$) was between the elaboration score and the total frequency counts on the NSNO, and the lowest correlation ($r = .21$) was between the flexibility score and the total frequency counts on the NSNO. Table 4 shows these results, with mean scores and standard deviations noted.

Discussion

As predicted, some evidence of concurrent validity between the NSNO and the TTCT was demonstrated for this sample of kindergarten children. The results indicated that the NSNO and the TTCT share some common features in their constructs or definitions of creativity, especially with respect to originality and elaboration. However, the total frequency counts on the NSNO were not significantly related to the TTCT fluency and flexibility scores, suggesting that both fluency and flexibility may be independent of the 17 key behaviors noted on the NSNO. Furthermore, the TTCT identified only 4 of the 45 children (9%) as having creative potential, whereas the NSNO system identified a total of 8 children (18%) as being able and creative. These results (twice as many children identified) are similar to those reported during the Nebraska

Project (Griffin, 1995) when the NSNO was being developed. In addition, while three children (6%) were identified as creative on both instruments, another five (11%) were identified only through the use of the NSNO and one (2%) only through the TTCT.

In general, it appears that the TTCT and the NSNO are not measuring the exact same constructs of creativity. This was not a surprising outcome, since the TTCT and the NSNO were not constructed on the same frame of reference and/or theory base, although it was a fundamental axiom in the development of the TTCT and the NSNO scales that both measure the same trait—creativity. In addition, the TTCT assesses the child's creative ability to produce uncommon or infrequent responses on a paper-and-pencil test, whereas the NSNO identifies the child's display of characteristics and/or behaviors over time related to creativity.

The findings require further examination and interpretation. First, the significant relationships between the originality and elaboration scores of the TTCT and the NSNO and the overall relatively weak but significant relationship between the two instruments indicate the usefulness of assessment approaches like the NSNO in measuring some constructs of divergent thinking skills considered essential estimates of the potential for creative performance. The results are

especially important in that behavioral observation has been recommended as a possible alternative and/or a supplement to traditional measures used to assess and identify young creative children. A relationship between behavioral observation and children's performance on paper-and-pencil divergent thinking tests, however, has been supported by few studies, and the lack of validity and reliability of observational procedures has been far more problematic. In this respect, the results of the present study offer important empirical evidence regarding the use of behavioral observation to identify creative young children.

Second, the low correlation between the fluency and flexibility scores of the TTCT and the NSNO seems to indicate that although a child may score high on a paper-and-pencil divergent thinking test measuring fluency and/or flexibility, there is no guarantee that an observation-based assessment approach will identify the same child. Since fluency is regarded as the most important aspect of the divergent thinking skills (Brown, 1989; Runco, 1991), the low correlation between the fluency score of the TTCT and the NSNO is discouraging. The low correlation could be due to intrinsic problems in administering and scoring the TTCT for a sample of this study, or it could be an indication of the major differences between the fluency score of the TTCT and the NSNO behaviors. Finally, the low correlation could be a combination of both of these factors. However, there may also be an alternative interpretation of the lack of significant relationship between the fluency and flexibility scores of the TTCT and the NSNO. Guilford (1967) distinguished two kinds of flexibility and three kinds of fluency being measured by different kinds of tests. Related to flexibility, one kind is what he called "spontaneous flexibility,"; the other one is "adaptive flexibility." Spontaneous flexibility is measured by divergent thinking tests and is related to different categories of responses a person makes, whereas adaptive flexibility is a person's abil-

ity to make changes of some kind—changes in interpretation of the task, in approach or strategy, or in possible solutions to succeed. Regarding fluency, Guilford also distinguished among "ideational fluency" (rate of generation of a quantity of ideas), "associational fluency"; (completion of relationships and diverse solutions to new problems), and "expressional fluency" (facile construction of sentences). Related to this study, the spontaneous flexibility and the ideational fluency seem related to what is measured on the TTCT, whereas the adaptive flexibility and the associational and expressional fluency are more related to what a teacher can observe and note during a classroom observation. These different kinds of flexibility and fluency may in fact be distinct features that could account for the lack of correlation between the NSNO and the flexibility/fluency scores of the TTCT. These different features of fluency and flexibility and their effect on the paper-and-pencil test and behavioral observation should be further examined in future studies.

Third, divergent thinking tests have frequently been criticized for their lack of association with creative behaviors in real and natural learning environments (Runco, 1991). This might explain the relatively weak correlations between the TTCT and the observation-based NSNO found in the present study. The significant correlation between the NSNO results and some subscores of the TTCT, however, would seem to suggest some support for the concurrent validity of tools like the NSNO, or at least an association between real-life creative performance and paper-and-pencil divergent thinking tests.

Finally, the results of this study are significant considering that few reliable and valid instruments, let alone developmentally appropriate ones, are available to identify young creative children. Published instruments that are accepted as reliable and valid for identifying creative young children are sparse. Even the most widely used teacher rating scale, Scales for Rat-

ing the Behavioral Characteristics of Superior Students (SRBCSS), did not show significant correlation coefficients to any of the subscores of the figural form of the TTCT (Renzulli et al., 1976). In addition, results from a more recent research study with a larger sample of children ($N=454$) were consistent with previous results indicating that the SRBCSS creativity scale was not significantly related to the students' performance on any of the TTCT subtests (Argulewicz & Kush, 1984). In this respect, the relatively weak but significant relationships between the NSNO and the TTCT in the present study are promising. Although the divergent thinking skills measured in the TTCT cannot and should not be equated with overall creative ability, they are important aspects or potentials of creative ability (Runco, 1991). Therefore, it is important that any instrument purporting to measure creative ability in young children demonstrate some degree of concurrent validity with divergent thinking tests. The observation-based elements of the NSNO appear to meet that criterion.

As with any assessment, classroom observation approaches are not perfect. Classroom-based observations, like those used for the NSNO, may not be appropriate as a replacement for divergent thinking tests like the TTCT due to their lack of adequate validity and lack of efficiency. The inability of classroom teachers in the present study (and as reported by Griffin, 1995, in the Nebraska Project) to collect needed observations for 45 children suggests a need to streamline the data collection process when using classroom-based observations for identifying creativity. The observers in the present study needed a total of 15 hours over a two-week period to collect all necessary information and valid observations. Furthermore, these observers had prior training in the reliable use of the protocol. Ensuring that any classroom teacher would be a reliable observer/reporter could be very time consuming and cost prohibitive. This time commitment alone may make

systems like those proposed by the NSNO too cumbersome for practical screenings and routine assessments.

However, the advantages of this type of assessment may outweigh the disadvantages. The ability of the NSNO in the present study to identify twice as many children as the TTCT suggests its strength in throwing a wider net to capture all "possibly" able and creative children. Such observation-based assessments deserve to be considered as a supplement to divergent thinking tests, and may well provide more accurate or meaningful information, especially for children who have high test anxiety or whose abilities are not represented in paper-and-pencil creativity tests (Sternberg, 1982). Current overreliance on a paper-and-pencil divergent thinking test should be avoided, especially, and at least, for young children. More open-ended and less formal assessment procedures, like those used for the NSNO, might be recommended with young children for additional information. As an observation-based system cannot totally replace the TTCT, neither should the TTCT be an autonomous tool; the two methods can complement each other. So far, no one assessment tool has shown sufficient reliability or validity as a sole criterion of creativity (Starko, 1995). Whenever possible, it is essential to use multiple sources of information to make valid judgments. "Multiple" sources of information could create "multiple" chances for children to be involved in gifted educational programs.

The procedures used for the NSNO demonstrated, in the final analysis, some promise as an approach that goes beyond the previous measure of creativity, and steps over the pitfalls of the traditional divergent thinking tests in identifying young creative children; however, the true potential of this approach will only be demonstrated as additional empirical data become available. Limitations of its use are warranted until all psychometric requirements are met. More evidence of criterion-related validity is

necessary before any instrument can be fully accepted as a valid measure of creativity. Future investigation should utilize (a) different and large target populations; (b) instruments other than the TTCT as a criterion measure; and (c) product-based assessment in real learning contexts (Han & Marvin, 2002). The two latter considerations would alleviate the limitation of measuring creativity exclusively with tests of divergent thinking.

Finally, studies that can correlate the results of a behavior-based criterion-referenced tool like the NSNO to variables such as academic performance, social/citizenship ratings and /or the quality and productivity of children's creative arts would be helpful to school personnel.

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Appendix A

